

## ROOM LAMP FOR VEHICLE

### FIELD OF THE INVENTION

The present invention relates to a room lamp for a vehicle  
5 in which a lamp main body and a roof trim are temporarily fixed  
so as to be modularized, and the lamp main body and the roof trim  
are integrally fully fixed to a roof panel.

### BACKGROUND OF THE INVENTION

10 As this kind of room lamp for a vehicle, for example, there  
are a room lamp for a vehicle previously invented by the inventor  
of this application (Japanese Patent Application No. 11-207799  
(Japanese Patent Application Laid-Open (JP-A) No. 2001-30827),  
Japanese Patent Application No. 11-207800 (JP-A No. 2001-30828),  
15 Japanese Patent Application No. 11-276673 (JP-A No. 2001-97112),  
Japanese Patent Application No. 2000-79321 (JP-A No. 2001-260747)  
and the like).

The room lamp for the vehicle is provided with a lamp main  
body, a plurality of engagement hooks protruded from the lamp main  
20 body, and a plurality of elastic engagement hooks. Further, the  
room lamp for the vehicle is structured such that at first a plurality  
of the engagement hooks are respectively engaged with a plurality  
of engaged sections formed in a roof trim, whereby the lamp main  
body is temporarily fixed to the roof trim and the lamp main body  
25 and the roof trim are modularized. Next, in an assembling line

for a motor vehicle, a plurality of the elastic engagement hooks are respectively elastically engaged with a plurality of engaged sections formed in the roof panel, whereby the lamp main body is fully fixed to the roof panel so as to be integrally formed with the roof trim.

As mentioned above, the room lamp for the vehicle is provided with an excellent assembling property such that the lamp main body can be easily positioned to the roof panel, a supporting structure of the roof trim to the roof panel becomes simple, and the like. Further, the room lamp for the vehicle can reduce a number of steps for an assembling (fixing) operation in the assembling line of the motor vehicle.

#### SUMMARY OF THE INVENTION

It is an object of this invention to provide a room lamp for a vehicle which does not require strictly secure a three-dimensional relative positional relation between an elastic engagement hook and an engaged section, and can fully fix a lamp main body to a roof panel easily and securely so as to be integrally formed with a roof trim.

According to one aspect of the present invention, in order to achieve the object mentioned above, an inclined engagement surface which is elastically engaged with an engaged section of a roof panel in a state of being inclined with respect to the roof panel is formed in an elastic engagement hook.

As a result, according to this aspect of the present invention, since the inclined engagement surface of the elastic engagement hook is elastically engaged with the engaged section in a state of being inclined with respect to the roof panel, it is possible to absorb an error of the three-dimensional relative positional relation between the elastic engagement hook and the engaged section. That is, the error of the relative positional relation in two directions (an X direction and a Y direction in Fig. 5(B)) can be absorbed by a deflection of the inclined engagement surface, and the error of the relative positional relation in remaining one direction (a Z direction in Fig. 5(B)) can be absorbed by a slip between the inclined engagement surface and the engaged section. Accordingly, the inclined engagement surface can be easily and securely brought into contact with the engaged section without strictly securing the three-dimensional relative positional relation between the elastic engagement hook and the engaged section.

Accordingly, it is possible to fully fix the lamp main body to the roof panel easily and securely so as to be integrally formed with the roof trim, in a fully fixing operation in which an operator can not visually observed due to the structure of the ceiling of the vehicle body or the like.

Other objects and features of this invention will become understood from the following description with reference to the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view which shows a room lamp for a vehicle according to an embodiment of the present invention in a state before being fully fixed as seen from a side of a ceiling of a vehicle body;

Fig. 2 is a view as seen from an arrow II in Fig. 1;

Fig. 3A is a cross sectional view along a line A-A in Fig. 2;

Fig. 3B is a cross sectional view along a line B-B in Fig. 2;

Fig. 4A is a cross sectional view of a state before being temporarily fixed;

Fig. 4B is a cross sectional view of a state after being temporarily fixed;

Fig. 4C is a cross sectional view of a state after being fully fixed;

Fig. 5A is an enlarged cross sectional view of a main section in a state immediately before the fully fixing is completed by an elastic engagement hook; and

Fig. 5B is an enlarged cross sectional view of a main section in a state in which the fully fixing is completed by the elastic engagement hook.

## DETAILED DESCRIPTION

A description will be given below of an example of an embodiment

of a room lamp for a vehicle according to the present invention with reference to the accompanying drawings. In this instance, in the specification, an upper section or an upper surface means an upper section or an upper surface at a time of assembling a lamp  
5 main body in a ceiling of a vehicle body, and a lower section or a bottom surface means a lower section or a bottom surface at a time of assembling the lamp main body in the ceiling of the vehicle body.

The ceiling of the vehicle body is generally constituted  
10 by a roof panel corresponding to a ceiling panel for an exterior and a roof trim 13 (a molded ceiling) corresponding to a ceiling panel for an interior. Further, the roof panel is generally, as shown in Fig. 4, constituted by an outer wall (not shown) positioned in an outer side of the vehicle, an inner wall 11 positioned in  
15 an inner side of a passenger room rather than the outer wall, and a mounting panel 12 (which may be commonly used as a reinforcing panel in some instances) which mounts a room lamp positioned between the inner wall 11 and the roof trim 13.

A peripheral edge section of the outer wall and a peripheral  
20 edge section of the inner wall 11 are bonded according to a spot welding or the like. The mounting panel 12 is, as shown in Fig. 1, constituted by a pair of flanges 12a extending rightward and leftward (or forward and backward) of the vehicle body, and a trapezoidal section 12b extending between the flanges 12a. The  
25 mounting panel 12 is fixed to the inner wall 11.

An engagement hook inserting recess section 12c and an elastic engagement hook inserting recess section 12d are formed in the flange 12a in a notched manner. Further, one edge section of the elastic engagement hook inserting recess section 12d forms an engaged section 12e.

As shown in Figs. 3 and 4, a lamp receiving recess section 13a open to an inner side of the passenger room is formed in the roof trim 13. An opening 13c is formed in a bottom section 13b of the lamp receiving recess section 13a. Further, an engaged section 13d is formed in the bottom section 13b. The engaged section 13d is constituted by an engagement hook through hole 13e, a slit 13f communicated with the engagement hook through hole 13e, and a peripheral section 13g of the slit 13f.

Further, the roof trim 13 is constituted by a base member 13h positioned in a side of the inner wall 11, and a mounting member 13i positioned in an inner side of the passenger room. The roof trim 13 includes a comparatively hard roof trim 13 and a comparatively soft roof trim 13. When there is employed the comparatively hard roof trim 13, for example, foamed urethane is employed for a material of the base member 13h, on the contrary, for example, a felt, a resin, a non woven fabric or the like is employed for a material of the mounting member 13i, respectively. Further, when there is employed the comparatively soft roof trim 13, for example, the foamed urethane is employed for a material of the base member 13h, and on the contrary, for example, a sheet fabric or the like is employed

for a material of the mounting member 13i, respectively. However, the material itself is not particularly limited.

A room lamp 20 (a lamp main body) is provided in the ceiling of the vehicle body structured in the manner mentioned above. The room lamp 20 is structured such as to be turned on and off, for example, on the basis of an interlock with an opening and closing operation of a door of the vehicle body, or manually turned on and off, in correspondence to a contact point selecting state of the switch.

10 The room lamp 20 is, as shown in Figs. 1 to 3, provided with a lamp housing 21, a bulb 23 attached to the lamp housing 21 via a pair of terminals 22, a lens 24 transmitting a lighting flux of light emitted from the bulb 23, a switch 25 selecting the lighting state of the bulb 23, and a reflector 26 covering an upper section  
15 of the bulb 23 and commonly serving as a shade.

A contact section 21f pressed against the roof trim 13 is formed in a periphery of the lamp housing 21.

A pair of engagement hooks 21b are integrally protruded on an upper surface 21a of the lamp housing 21 so as to protrude upward.

20 A pair of engagement hooks 21b are arranged so as to be substantially divided on a diagonal line on the basis of a center (or a center of gravity) of the lamp housing 21. Lance-shaped front ends 21d opposing to each other in a side elevational view are formed in a pair of engagement hooks 21b.

25 Further, two holding openings 21c are formed on the upper

surface 21a of lamp housing 21. One ends 27c of a pair of elastic engagement hooks 27 are respectively inserted and fixed to edge sections in one wall surfaces of these two holding openings 21c.

Each of a pair of elastic engagement hooks 27 is constituted  
5 by a fixed end section of the one end 27c, a free end section of another end 27d which is free with respect to the lamp housing 21, and a leaf spring in which a circular arc-shaped upper end 27a and a lance-shaped front end section 27b disposed in a middle thereof are bent. The upper end 27a, the front end section 27b and the  
10 another end 27d can elastically deform with respect to the one end 27c.

A pair of elastic engagement hooks 27 are protruded upward from the upper surface 21a of the lamp housing 21. A pair of elastic engagement hooks 27 are arranged so as to be substantially divided  
15 on a diagonal line on the basis of the center of the bulb 23. The lance-shaped front end sections 27b of a pair of elastic engagement hooks 27 move apart from each other in a side elevational view.

Inclined engagement surfaces 27e elastically engaging with the engaged sections 12e in a state of being inclined with respect  
20 to the mounting panel 12 are formed in a pair of elastic engagement hooks 27. The inclined engagement surfaces 27e are formed so as to be bent obliquely downward from the front end section 27b.

A drop-out preventing piece 27f brought into contact with the lamp housing 21 at a time when the inclined engagement surface  
25 27e is elastically engaged with the engaged section 12e of the



mounting panel 12 is formed near the another end 27d of each of a pair of elastic engagement hooks 27. The drop-out preventing piece 27f is bent obliquely downward from the inclined engagement surface 27e.

5 A contact section 27g brought into contact with the lamp housing 21 at a time when the drop-out preventing piece 27f is brought into contact with the lamp housing 21 is formed in a side of the another end 27d of the drop-out preventing piece 27f. Further, an inclined section 27h inclined with respect to the lamp housing  
10 21 is formed between the contact section 27g and the drop-out preventing piece 27f. The inclined section 27h is bent obliquely upward from the drop-out preventing piece 27f. Further, the contact section 27g is formed in a corner section bent obliquely downward from the inclined section 27h.

15 The room lamp for the vehicle according to this embodiment is structured in the manner mentioned above, and a description will be given below of a fixing operation to the ceiling of the vehicle body.

At first, as shown in Figs. 4(A) and 4(B), the room lamp  
20 14 is temporarily fixed to the roof trim 13 by inserting an upper end of the engagement hook 21b from an engagement hook through hole 13e while forcibly expanding a slit 13f by the front end 21d of the engagement hook 21b and bringing a front end bottom surface of the engagement hook 21b into contact with an upper surface of  
25 a peripheral section 13g. That is, two engagement hooks 21b are

respectively engaged with two engaged sections 13d of the roof trim 13, whereby the room lamp 14 and the roof trim 13 are modularized. In this instance, the slit 13f closes by itself due to a material property of the roof panel 13, a load of the room lamp 14 or the like.

Next, as shown in Fig. 4C, the room lamp 14 is fully fixed to the mounting panel 12 corresponding to the roof panel so as to be integrally formed with the roof trim 13 by respectively elastically engaging the inclined engagement surfaces 27e of two elastic engagement hooks 27 with two engaged sections 12e.

At this time, since another end 27d of the elastic engagement hook 27 is a free end, a section extending from the front end section 27b to the another end 27d is displaced to a side of the one end 27c while a circular arc of the upper end 27a becomes small so as to be guided along a circular arc shape and an inclined shape extending from the upper end 27a of the elastic engagement hook 27 to the front end section 27b, as shown in Fig. 5A.

Further, when the front end section 27b of the elastic engagement hook 27 extends through an elastic engagement hook inserting recess section 12d of the mounting panel 12, a deformed section is elastically returned as shown in Fig. 5B, and the inclined engagement surface 27e is elastically engaged with engaged section 12e in a state of being inclined with respect to the mounting panel 12. Further, as the same time, the drop-out preventing piece 27f is brought into contact with a lower corner of the peripheral edge

section bottom surface 21e in a state of being inclined with respect to the lamp housing 21. Further, the contact section 27g is brought into contact with the peripheral edge section bottom surface 21e via the inclined section 27h in a state of being inclined with respect to the lamp housing 21.

As mentioned above, in the room lamp for the vehicle according to this embodiment, the inclined engagement surface 27e of the elastic engagement hook 27 is elastically engaged with the engaged section 12e in a state of being inclined with respect to the plate surface of the mounting panel 12. That is, as shown in Fig. 5(B), the inclined engagement surface 27e is elastically engaged with the engaged section 12e in a state of being upward inclined toward the side of the front end section 27b so as to extend between the upper surface side and the bottom surface side of the mounting panel 12.

As a result, the room lamp for the vehicle according to this embodiment can absorb an error of a three-dimensional relative positional relation between the elastic engagement hook 27 and the engaged section 12e. That is, as shown in Fig. 5(B), the errors of the relative positional relations in an X direction (a right and left horizontal direction) and a Y direction (an upper and lower vertical direction) can be absorbed by the deflection of the inclined engaged surface 27e. Further, the error of the relative positional relation in a Z direction (a direction orthogonal to the X direction and the Y direction mentioned above) can be absorbed by a mutual

slip between the inclined engagement surface 27e and the engaged section 12e. Accordingly, in the room lamp for the vehicle according to this embodiment, the inclined engagement surface 27e can be easily and securely brought into contact with the engaged section 12e without necessity of strictly securing the three-dimensional relative positional relation between the elastic engagement hook 27 and the engaged section 12e.

Accordingly, the room lamp for the vehicle according to this embodiment can fully fix the room lamp 20 to the mounting panel 12 in an easy and securely manner so as to be integrally formed with the roof trim 13, in a fully fixing operation which can not be visually observed by an operator due to the structure of the ceiling of the vehicle body or the like.

Further, in the room lamp for the vehicle according to this embodiment, since the elastic engagement hook 27 is constituted by the leaf spring, it is easy to bent the respective sections 27a to 27g in the elastic engagement hook 27 in a state of securing a comparatively strong elastic force. Further, it is not necessary to strictly consider the absorption (a spring back or the like) of the error in the inclined engagement surface 27e, and it is possible to inexpensively manufacture the elastic engagement hook 27.

Further, in the room lamp for the vehicle according to this embodiment, the drop-out preventing piece 27f in the free end section of the elastic engagement hook 27 is brought into contact with the lower corner of the peripheral edge section bottom surface 21e in

the lamp housing 21 in a state of being inclined with respect to the lamp housing 21 at a time when the inclined engagement surface 27e is elastically engaged with the engaged section 12e of the mounting panel 12. Accordingly, in the room lamp for the vehicle according to this embodiment, the elastic engagement hook 27 having a high rigidity can be obtained, and it is possible to fully fix the room lamp 21 by the elastic engagement hook 27 having a high rigidity.

Further, in the room lamp for the vehicle according to this embodiment, the contact section 27g is brought into contact with the peripheral edge section bottom surface 21e via the inclined section 27h in a state of being inclined with respect to the lamp housing 21. As a result, when the load given from the room lamp 20 is applied to the contact section 27g in a direction of a solid arrow in Fig. 5(B), by the inclined section 27h between the drop-out preventing piece 27f and the contact section 27g, the inclined section 27h is bent in the horizontal direction. Accordingly, it is possible to maintain a holding force (a lift-up force) of the elastic engagement hook 27 applied by the load from the room lamp 20 high.

Further, since the room lamp for the vehicle according to this embodiment is structured such that the contact section 21f is provided in the periphery of the lamp housing 21, the contact section 21f is brought into contact with the roof trim 13 at a time of assembling the room lamp 20 in the ceiling of the vehicle body.

At this time, when the roof trim 13 is comparatively hard,  
it is possible to securely position the room lamp 20 in the vertical  
direction of the vehicle body in consort with the elastic engagement  
hook 27 only by bringing the contact section 21e into contact with  
5 the wall surface close to the open end of the lamp receiving recess  
section 13a, whereby it is possible to absorb a play of the room  
lamp 14.

Further, when the roof trim 13 is comparatively soft, it  
is possible to further securely position the room lamp 14 in the  
10 vertical direction of the vehicle body in consort with the elastic  
engagement hook 27 only by bringing the contact section 21e into  
contact with the wall surface close to the open end of the lamp  
receiving recess section 13a so as to eat into therewith, it is  
possible to sufficiently absorb with respect to the size error  
15 between the room lamp 14 and the ceiling of the vehicle body, and  
it is also possible to absorb a play of the room lamp 14.

In this instance, in the embodiment mentioned above, there  
is disclosed a structure in which the elastic engagement hook 27  
is constituted by the leaf spring, however, in the present invention,  
20 when there is considered a relation of engagement between the  
inclined engagement surface 27e and the engaged section 12e, it  
is possible to form by a resin integrally formed with the lamp housing  
21, a rubber or the like.

That is, the engagement hook 21b which temporarily fixes  
25 is integrally formed with the lamp housing 21 and the elastic

engagement hook 27 which fully fixes is formed by the independent member from the lamp housing 21, because a difference of height of the room lamp 20 generated between the temporarily fixing time and the fully fixing time can be absorbed.

5           On the contrary, since the inclined engagement surface 27e according to the present invention is elastically engaged with the engaged section 12e in a state of being inclined with respect to the mounting panel 12 at a time of fully fixing, it is possible to sufficiently absorb the difference of height between the temporarily fixing time and the fully fixing time. Accordingly, 10           according to the present invention, it is possible to form the elastic engagement hook 27 by the resin integrally formed with the lamp housing 21, the rubber or the like.

          Although the invention has been described with respect to 15           a specific embodiment for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art which fairly fall within the basic teaching herein set forth.